especially as the effect of the Variation both on the distance and the velocity must be considerable. The sidereal period is probably between three and four years, the synodic period being about one year shorter if the motion be retrograde.

The mean distance of satellite VII from Jupiter is 0·0785, so that the value of the distance found for the new body is about three times as great.

Table giving approximate values of the perturbations of Halley's Comet by Jupiter and Saturn in the first and fourth quadrants of the orbit. By P. H. Cowell, M.A., F.R.S., and A. C. D. Crommelin, B.A.

A sufficient number of revolutions of the comet have now been computed to enable the perturbations to be tabulated as functions of g', the mean anomaly of the disturbing planet at the adjacent perihelion passage. The formula for determining g' was given in *M.N.*, lxviii. 3, p. 177. The table is not intended to supersede calculation, but it serves—

(1) To form a good first approximation to the date of any perihelion passage, as a preliminary to more exact calculation.
(2) To detect any serious errors of calculation.
(3) To readily correct computations made with an erroneous assumed date of perihelion, by means of the rate of change of the tabular quantities.

	Jupiter, 1st quad.			Jupiter, 4th quad.			Saturn, 1st quad.			Saturn, 4th quad.		
g'	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$
°	″	″	″	″	″	″	″	″	″	″	″	′
0	+·85	−210	+140	+·26	−460	− 60	+·19	0	+ 20	−·03	+ 10	+ 1C
10	·93	130	160	·32	450	90	·14	− 30	20	·06	0	1C
20	·99	− 30	180	·37	430	120	·09	50	20	·10	0	2C
30	1·05	+100	200	·43	410	140	·07	60	20	·15	+ 10	2C
40	1·10	220	200	·48	380	150	·05	50	10	·19	20	3C
50	1·13	340	190	·54	350	160	·04	30	10	·23	30	3C
60	1·14	450	170	·59	320	170	·03	20	10	·24	20	3C
70	1·13	560	140	·64	270	170	·02	− 10	10	·23	+ 10	3C
80	1·10	660	90	·67	200	160	·01	+ 10	10	·21	− 10	3C
90	·97	670	40	+·38	−100	130	+·01	20	+ 10	·18	30	3C
100	·71	610	+ 10	−·27	+130	110	·00	40	0	·15	50	3C
110	·39	470	− 30	·90	420	70	−·01	50	0	·12	60	2C
120	+·03	330	70	1·20	620	− 30	·01	60	0	·10	70	2C
130	−·18	210	110	1·28	710	+ 10	·02	60	0	·07	80	1C
140	·24	100	120	1·25	640	50	·03	60	0	·05	80	+ 1C

	Jupiter, 1st quad.			Jupiter, 4th quad.			Saturn, 1st quad.			Saturn, 4th quad.		
g'	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$	$\int dn$	$\int d\varpi$	$\int d\zeta$
150°	″·27	+ 20″	130″	″1·20	560″	90″	″·04	50″	− 10″	″·03	90″	0″
160	·27	50	130	1·16	470	120	·04	40	10	− ·02	80	0
170	·27	120	130	1·12	370	140	·05	30	10	·00	80	− 10
180	·27	170	130	1·08	270	160	·06	20	20	+ ·01	80	20
190	·26	220	120	1·03	180	170	·06	+ 10	20	·03	70	30
200	·24	280	110	·97	+ 70	180	·06	− 10	10	·04	50	20
210	·23	340	90	·90	− 30	190	·06	20	10	·05	40	20
220	·21	390	80	·83	130	200	·05	40	− 10	·06	20	10
230	·19	460	60	·76	230	200	·04	50	0	·06	− 10	10
240	·16	520	40	·68	320	190	·03	70	0	·06	+ 10	10
250	·12	580	− 20	·58	420	180	− ·02	80	0	·06	20	10
260	− ·06	620	0	·48	510	160	·00	90	+ 10	·06	30	10
270	·00	640	+ 20	·38	550	130	+ ·02	90	20	·05	40	10
280	+ ·07	640	40	·29	570	110	·04	100	20	·04	50	10
290	·16	630	60	·19	590	90	·07	90	30	·03	50	10
300	·25	610	80	·11	600	70	·09	90	30	·02	60	− 10
310	·34	580	90	− ·04	600	40	·12	90	30	+ ·01	60	0
320	·44	530	100	+ ·03	580	+ 10	·15	80	30	·00	50	0
330	·54	470	110	·09	560	− 10	·19	60	30	·00	30	0
340	·65	400	120	·14	540	30	·22	40	30	− ·01	+ 10	0
350	+ ·75	− 310	+ 130	+ ·20	− 510	− 40	+ ·22	− 20	+ 30	− ·02	0	+ 10

To $\int d\zeta$ in the first quadrant must be added the corresponding value of $\int dn \times$ period in days.

The argument g' is the value of the planet's mean anomaly at the preceding perihelion passage for the first quadrant, at the following passage for the fourth quadrant.

Note on the condition for the passage of the Earth through the plane of Saturn's Ring. By H. H. Turner, D.Sc., F.R.S., Savilian Professor.

1. The interesting observations made recently on the ring seen edgewise have brought several inquiries as to the recurrence of this beautiful phenomenon; and the following note, originally made some years ago in consequence of an inquiry from Mr. C. T. Whitmell, may be of use to others. The late Mr. R. A. Proctor gives in his book *Saturn and his System* a general account of the manner in which the Earth may pass through the plane of the ring, either once or three times, at each favourable opportunity. The present note gives the explanation in more compact form.

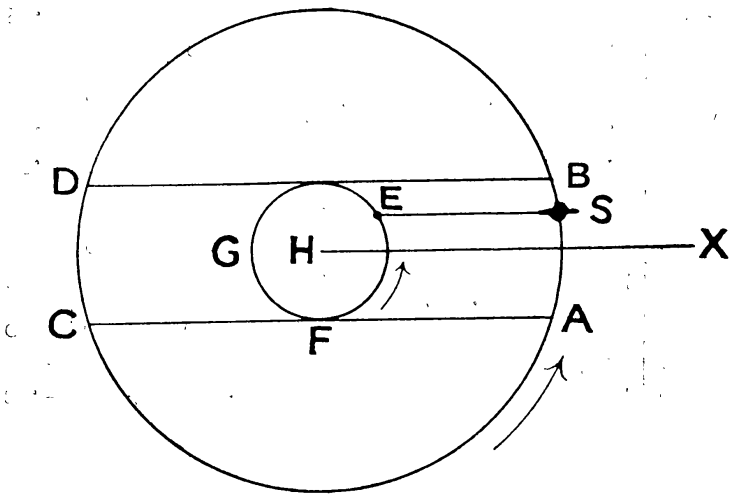

FIG. 1.

2. Let H be the Sun (fig. 1), EGF, ABDC, the orbits of the Earth and Saturn, supposed circular and in one plane. Let BD and AC be two tangents to the Earth's orbit parallel to the plane of Saturn's ring. Then if S be Saturn and E the Earth at a time of passage through the ring, ES must be parallel to BD or AC. Hence Saturn must be either in the portion AB or DC of his orbit. Since his orbit is ten times the size of the Earth's, these favourable opportunities are confined to limited periods which recur at long intervals. AB is about $\frac{1}{15}$ of the semi-orbit, and is described in about a year, so that the Earth meanwhile makes a complete revolution. If, when Saturn is near A, the Earth is near F, then there may be three passages through the ring.

3. To find the condition in exact terms, take HX parallel to AC or BD as axis of x. Let the radius of the Earth's orbit be unity, and that of Saturn's orbit n^2. The co-ordinates of the Earth may be written

$$x_1 = \cos t,\ y_1 = \sin t,$$